

## IMAGING BASED COMPUTATIONAL MODELING IN ORTHOPEDIC BIOMECHANICS

JOÃO MANUEL R. S. TAVARES<sup>\*</sup>, ABDELWAHED BARKAOU<sup>†</sup>

<sup>\*</sup> Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial, Departamento de Engenharia Mecânica, Faculdade de Engenharia, Universidade do Porto  
Rua Dr. Roberto Frias, s/n, 4200-465 PORTO, PORTUGAL  
e-mail: [tavares@fe.up.pt](mailto:tavares@fe.up.pt), url: [www.fe.up.pt/~tavares](http://www.fe.up.pt/~tavares)

<sup>†</sup> International University of Rabat, Campus de l'UIR, Parc Technopolis  
Rocade de Rabat-Salé, 11100 – Sala Al Jadida - Morocco  
[abdelwahed.barkaoui@uir.ac.ma](mailto:abdelwahed.barkaoui@uir.ac.ma)

**Key words:** Biomechanics, Biomedical imaging, Computational modeling, Finite Element Methods.

### ABSTRACT

In the field of orthopedic biomechanics, the geometry, the constituent's elements of the joints and material properties of tissues are the most important parameters for the study of biomechanical and mechanobiology behaviour of bone tissue as well as the diagnosis and choice of treatment. Medical imaging is a useful tool which has revolutionized the understanding and diagnostics in the field of bone biomechanics. Recently, the development and improvement of software and hardware for medical imaging has progressed enormously so that new technics have been discovered and developed. Medical imaging is now widely used for bone alignment measurements, joint motion studies, stress and strain analysis, and to determine the material properties of the musculoskeletal system and of construction. Moreover, some imaging techniques allow the generation of three-dimensional specific patient models used for finite elements (FEs) based studies. In the recent decades, FE methods have been widely used in the field of biomechanics engineering and in the regenerative medicine. Human bone FE modeling have provided a potential tool in assessing a wide variety of outcomes in a parametric and repeatable manner. These models are commonly derived from medical images using different imaging algorithms and tools. This mini-symposium will be a forum focus on presenting and discussing recent approaches combining FE methods and pacific subject modelling based on medical imaging techniques, mainly addressing orthopedic biomechanics studies.